

**Evidence-Based Effective Strategies for Preventing Injuries:**

**Child Restraints, Seat Belts, Reducing Alcohol-Impaired Driving,  
Teen Drivers, Child Abuse Prevention, Bike Helmets, Residential Fire, and  
Drowning**

**Compiled by L.J. David Wallace, MSEH  
National Center for Injury Prevention and Control  
Centers for Disease Control and Prevention  
2002**

*Injuries are the most important cause of death and disability for the first half of the human lifespan and are the leading cause of years of potential life lost before age 65. Hundreds of injury intervention programs have been implemented, but not all strategies have been evaluated. The implementation of prevention strategies of proven effectiveness is of major public health importance. The reason is straightforward: Because staff time and resources are always limited, efforts should be used for those injury prevention strategies that have been evaluated and shown to be effective. Dr. Fred Rivara, Editor, Systematic Reviews of Strategies to Prevent Motor Vehicle Injuries, American J. of Preventive Medicine, January, 1999.*

As Dr. Rivara notes, it is important to know which injury prevention strategies are proven effective, and those that are less effective, in order to have the greatest impact on your program. This document is a brief compilation of proven or promising injury prevention strategies and sources of where to go for more information. Most of the information on motor vehicle injury prevention strategies came from two separate systematic reviews of the literature: 1) *Systematic Reviews of Strategies to Prevent Motor Vehicle Injuries, American J. of Preventive Medicine, January, 1999*, edited by Drs. Fredrick Rivara and Ellen MacKenzie; and 2) *The Guide to Community Preventive Services: Reducing Injuries to Motor Vehicle Occupants, Systematic Reviews of Evidence, Recommendations from the Task Force on Community Preventive Services, and Expert Commentary. American J. of Preventive Medicine, November, 2001*, edited by Drs. Stephanie Zaza and Robert Thompson. Literally thousands of published articles were reviewed before coming to conclusions about the effectiveness of these strategies to prevent motor vehicle-related injuries. There are other promising strategies that were not included likely because of the small number of articles published or problems with the evaluation. Environmental modification strategies such as installing streetlights and sidewalks along roadways where pedestrians were being injured are not included for example, but these types of strategies have proven promising in reducing injuries in several rural communities.

The Harborview Injury Prevention Research Center in Seattle, Washington, has conducted a smaller scale systematic review of strategies to prevent childhood injury with the results summarized on their website: <http://depts.washington.edu/hiprc>. This is an excellent source of information regarding childhood injury prevention.

Almost all of the strategies in this document address unintentional injuries. From a public health perspective, unintentional injury prevention has been around much longer than the prevention of violence; so much more is known about effective prevention strategies. Hopefully in the near future systematic reviews will be conducted for violence prevention strategies to better address this leading public health problem. For more information on youth violence check out these recent publications:

- Thorton TN, Craft CA, Dahlberg LL, Lynch BS, Baer K. *Best Practices of Youth*

*Violence Prevention: A Sourcebook for Community Action.* Atlanta: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2000. Available from <http://www.cdc.gov/ncipc/>.

- US Department of Health and Human Services. (2001). *Youth Violence: A Report of the Surgeon General.* Rockville, MD: US DHHS, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; Substance Abuse and Mental Health Services Administration; and National Institutes of Health, National Institute of Mental Health. Available for sale from the US Government Printing Office, Washington, DC, or free from <http://www.surgeongeneral.gov/library/youthviolence/youthviolence.htm>

I would like to thank Mr. Robert Letourneau, MPH, of the University of North Carolina Injury Prevention Research Center for his help on layout design of this document.

Child Restraint Use		
Intervention	Recommendation	Source
Mandatory Child Restraint Use Laws	Proven effective for increasing use rates when enforced by police; Strongly recommended. Child safety seats when correctly installed and used reduce the risk of death by 71% for infants and 54% for toddlers aged 1-4 years.	<i>The Guide to Community Preventive Services, Reducing Injuries to Motor Vehicle Occupants, Systematic Reviews of Evidence, Recommendations from the Task Force on Community Preventive Services, and Expert Commentary.</i> American J of Preventive Med 2001;21(4s) (1); <a href="http://www.thecommunityguide.org">www.thecommunityguide.org</a> .  and CDC. Motor-Vehicle Occupant Injury: Strategies for Increasing Use of Child Safety Seats, Increasing Use of Safety Belts, and Reducing Alcohol-Impaired Driving. A Report on Recommendations of the Task Force on Community Preventive Services. MMWR 2001;50(No.RR-7) (2) <a href="http://www.cdc.gov/mmwr/PDF/rr/rr5007.pdf">http://www.cdc.gov/mmwr/PDF/rr/rr5007.pdf</a>
Communitywide information and Enforcement Campaigns	Proven effective as a way to increase usage rates at different times of the year with special enforcement campaigns combined with public awareness/education; Recommended.	NHTSA; <i>the Guide</i> (1); MMWR (2)
Distribution Combined with Education Programs	Proven effective in raising use rates when targeted to those in need of child safety seats; Strongly recommended.	<i>The Guide</i> (1). MMWR (2)
Incentives plus Education Programs.	Moderately effective in raising use rates short term during the program, but use tends to fall off after the intervention is discontinued; Recommended with additional incentive program at regular intervals post-intervention.	<i>The Guide</i> (1), MMWR (2), and <i>Systematic Reviews of Strategies to Prevent Motor Vehicle Injuries.</i> American Journal of Preventive Medicine 1999; 16(1S) (3).
Education-Only Campaigns	Insufficient evidence of proven effectiveness when used alone. Education can be useful in teaching young children safety behaviors, such as the use of seatbelts, and training parents in correct car seat installation for example. Education is most effective when combined with enforcement or policy strategies.	<i>The Guide</i> (1); MMWR (2), Christoffel T, Gallagher S. <i>Injury Prevention and Public Health: Practical Knowledge, Skills, and Strategies.</i> Aspen Publishers: 1999.

Use of Seat Belts		
Intervention	Recommendation	Source
<p>Mandatory Seat Belt Use Laws</p> <p>Lap/shoulder belts when used correctly, reduce the risk of motor vehicle-related death or serious injury by 45-60%.</p>	Proven effective for increasing use rates when enforced by police; Strongly recommended.	NHTSA; CDC; <i>the Guide</i> (1); MMWR (2)
Enhanced Enforcement Campaigns	Proven effective as a way to increase usage rates at different times of the year with special enforcement campaigns combined with public awareness/education; Strongly recommended.	NHTSA; <i>the Guide</i> (1). MMWR (2)
Primary Enforcement Use Laws vs. Secondary Enforcement Laws	Primary enforcement laws appear to be more effective than secondary use laws in increasing seat belt use. Primary enforcement use laws are strongly recommended.	NHTSA; <i>the Guide</i> (1), MMWR (2) and <i>Systematic Reviews</i> (3).
Incentives plus Education Programs.	Pending review in <i>the Guide</i> (1), but effectiveness is likely similar to the results for child safety seats above: moderately effective in raising use rates short term. Recommended with additional incentive programs at regular intervals post-intervention to keep use rates up.	NHTSA; and <i>the Guide</i> (1)
Mass Media Campaigns	Review pending in <i>the Guide</i> (1). Public awareness campaigns are most effective when combined with enforcement, policy, or incentive programs. Media educational campaigns are likely to have the best effect when used to address childhood injury, due to parents desire to protect children.	<i>The Guide</i> (1)

Strategies to Reduce Alcohol-Impaired Driving		
Intervention	Recommendation	Source
Random Breath Testing, Sobriety Checkpoints	Proven effective in reducing alcohol-related crashes and deaths by approximately 17-25%. Strongly recommended to be a part of all police enforcement programs.	<i>The Guide (1)</i> , MMWR (2), <i>Systematic Reviews (3)</i> , CDC, and NHTSA.
Zero Tolerance Blood Alcohol Concentration (BAC) Laws for Young Drivers	Proven effective for drivers less than 21 years old in reducing fatal crashes. Laws with lower BAC limits (.02) appear to be more effective than laws with higher limits (.04-.06). One study found that including public information and awareness increased the impact of the law. Recommended.	<i>The Guide (1)</i> , MMWR (2), <i>Systematic Reviews (3)</i> , CDC.
Reducing Legal BAC to .08%	Proven effective in reducing alcohol-related crashes. Strongly recommended.	<i>The Guide (1)</i> , MMWR (2), and NHTSA.
Administrative License Revocation (ALR) Laws	Studies in California, North Dakota, and Nevada found ALR laws to be effective in increasing deterrence to drunk driving, and reducing drunk driving offences and crashes. Recommended.	<i>Systematic Reviews (3)</i> , and NHTSA. Review is pending in <i>the Guide (1)</i> .

### Strategies to Reduce Teen Driver Crashes

Intervention	Recommendation	Source
Nighttime Driving Restriction Curfew Laws	Most fatal nighttime crashes among young drivers in the US occur between 9 PM and midnight. Several studies from the US and Canada have found that ordinances that restrict unsupervised teen driving at night resulted in reducing teen driver fatalities by about 25%. It is recommended that these curfew restrictions start at 10 PM and apply to drivers 15-17 years of age. Exceptions are allowed.	<i>Systematic Reviews (3)</i> , and the Insurance Institute for Highway Safety, Graduated Licensing: a Blueprint for North America, 1999. <a href="http://www.hwysafety.org/">http://www.hwysafety.org/</a>

### Strategies to Reduce Child Abuse and Neglect

Intervention	Recommendation	Source
Home Visitation for High Risk Mothers	Home visits to new mothers are a promising strategy to decrease child abuse. While the data are not yet definitive, the US Advisory Committee on Child Abuse and Neglect recommends universal home visiting for all new mothers. If it is done, high-risk families may need to be followed long-term. It appears that using nurses is the most effective.	Olds DL, Henderson CR Jr, Chamberlin R, Tatelbaum R. Preventing child abuse and neglect: a randomized trial of nurse home visitation. <i>Pediatrics</i> , 1986; 78(1): 65-78  Systematic Reviews of Childhood Injury, Harborview Injury Prevention Research Center (4). <a href="http://depts.washington.edu/hiprc">http://depts.washington.edu/hiprc</a>

### Strategies to Increase Bike Helmet Use

Intervention	Recommendation	Source
General	When worn correctly, several studies have shown that bike helmets are proven effective in reducing head injuries from bicycle crashes by 69-85%.	Thompson RS, Rivara FP, Thompson DC. A case-control study of the effectiveness of bicycle safety helmets. <i>New England J of Medicine</i> 1989; 320: 1361-7.
Mandatory Helmet Use Laws	Several studies from the US and Australia have found that legislation is quite effective in increasing helmet use and that the effect is not heavily dependent on enforcement. Laws are most effective when combined with community education and helmet distribution programs over a sustained period of time. Recommended.	CDC. Injury-Control Recommendations: Bicycle Helmets. <i>MMWR</i> 1995; 44.  Systematic Reviews of Childhood Injury (4).

## Strategies to Reduce Injuries From Residential Fires

Intervention	Recommendation	Source
<p>Smoke Detectors/Alarms</p> <p>Children aged five and younger and adults aged 65 years and older, African Americans, American Indians/Alaska Natives, rural dwellers, and persons living in substandard housing or older manufactured homes are at greatest risk of residential fire death. Preventing fire-related injuries costs far less than treating them: \$1 spent on smoke alarms saves \$69. Almost half of home fires and three-fifths of fire deaths occur in homes with no working smoke alarms.</p>	<p>Runyan and others found that having a working smoke detector in the home reduced the risk of death from a house fire by as much as 71%. Some studies have found that up to half of smoke detectors in Native American homes were inoperable, often disconnected due to nuisance alarms. Kuklinski and others recommended installing photoelectric detectors in place of ionization detectors to help prevent nuisance alarms.</p>	<p>Runyan CW, Bangdiwala SI, Linzer MA, Sacks JJ, Butts J. Risk factors for fatal residential fires. <i>New England Journal of Medicine</i>, 1992; 37(12);</p> <p>Systematic Reviews of Childhood Injury, Harborview Injury Prevention Research Center (4). <a href="http://depts.washington.edu/hiprc">http://depts.washington.edu/hiprc</a>.</p> <p>Kuklinski DM, Berger LR, Weaver JR. Smoke Detector Nuisance Alarms: a Field Study in a Native American Community. <i>NFPA Journal</i>, 1996; September.</p>
<p>Smoke alarm distribution program combined with education and publicity campaign. Surveillance data used to target areas of highest risk</p>	<p>Mallonee and others found that residential fire injury rates were reduced by up to 80% after targeting high-risk neighborhoods with smoke alarms combined with an education and media campaign. A critical component to the success of the program was using injury surveillance to target the neighborhoods with the highest risk and greatest need. Strongly recommended.</p>	<p>Mallonee S, Istre GR, Rosenburg M, Reddish DM, Jordan F, Silverstein P, Tunell W. Surveillance and prevention of residential-fire injuries. <i>New England J of Medicine</i>, 1996; 335(1): 27-31.</p> <p>Systematic Reviews of Childhood Injury (4).</p>
<p>Smoke Alarm Legislation, Housing Codes.</p>	<p>Proven effective in ensuring smoke alarms are installed in new homes. Legislation requiring installation of smoke detectors in new and existing housing combined with community-based campaigns and distribution programs seems to be the most effective in increasing usage rates. Strongly recommended.</p>	<p>Systematic Reviews of Childhood Injury (4).</p>



## Strategies to Prevent Drowning

Intervention	Recommendation	Source
<p>In the United States, nearly 4,500 people die each year from drowning (NCIPC, WISQARS). Death rates from drowning are highest in children less than 5 years old and in teens and young adults 15-24 years. In 1998, drowning was the second leading cause of injury death for children 1-14 years of age (NCHS).</p> <p>In terms of effective strategies to prevent drowning, pool fencing has been studied the most. Four-sided isolation fencing has proven the most effective in reducing pool-related drowning among young children.</p>	<p>Causes of and factors related to drowning vary greatly by age, gender, geography, season, race, and economic status (AAP). For infants, bathtub drowning poses the greatest hazard. Once children attain mobility as toddlers, pools pose the greatest risk of immersion injury. Pools continue to play a role in drowning among young, school-age children, but immersion in natural bodies of water either while swimming or boating plays an increasingly important role as children move into adolescence. Among adolescents, alcohol use around water has been found to be associated with as many as one-half of drowning incidents (Harborview Injury Prevention Research Center).</p>	<p>Committee on Injury and Poison Prevention, American Academy of Pediatrics. <i>Injury Prevention and Control for Children and Youth</i>. American Academy of Pediatrics, Elk Grove Village, IL; 1997.</p> <p>Systematic Reviews of Childhood Injury, Harborview Injury Prevention Research Center (4). <a href="http://depts.washington.edu/hiprc">http://depts.washington.edu/hiprc</a></p>
Targeting Infants	<p>Infants commonly drown in bathtubs or other fluid-filled containers such as 5-gallon buckets. Most bathtub drownings occurred when adults stepped away for only a short time. Young children should never be left alone in bathtubs. Parents and caregivers need to understand the risks that bathtubs and 5-gallon buckets pose to young children. Counseling of new parents and educational campaigns focusing on young children may be promising. The Injury Prevention Program (TIPP) of the AAP has recommendations on their website.</p>	<p>TIPP Home Water Hazards for Young Children. American Academy of Pediatrics. <a href="http://www.aap.org/family/tippmain.htm">http://www.aap.org/family/tippmain.htm</a></p> <p>Infants &amp; Toddlers Can Drown in 5-Gallon buckets. Consumer Product Safety Commission. <a href="http://www.cpsc.gov/consumer.html">http://www.cpsc.gov/consumer.html</a></p>

## Strategies to Prevent Drowning

Intervention	Recommendation	Source
<p>Targeting Preschool Age Children, Age 1-5 Years</p> <p>In 1998, 546 children aged 1-5 years drowned in the United States (NCIPC, WISQARS). Backyard swimming pools and spas pose the greatest drowning risk to preschoolers, particularly ages 18 to 30 months. Most children drown in their own pool and while being supervised by one or both parents. Most children were missing from their parents less than 5 minutes (AAP, CPSC).</p>	<p>Several studies have shown 4-sided isolation fencing to be effective at preventing pool-related drowning among children. Compared with in-ground pools without 4-sided fencing, 60% fewer drownings occur in pools with 4-sided isolation fencing (CPSC). Because three-sided pool fencing still allows for unintentional access through the house, 4-sided isolation pool fencing is strongly recommended as an effective strategy in preventing submersion injuries. Legislation requiring fencing does increase the percentage of pools that are fenced. Legislation should require isolation fencing with secure, self-latching gates (Harborview Injury Prevention Research Center).</p>	<p>TIPP Home Water Hazards for Young Children. American Academy of Pediatrics. <a href="http://www.aap.org/family/tippmain.htm">http://www.aap.org/family/tippmain.htm</a></p> <p>Systematic Reviews of Childhood Injury, Harborview Injury Prevention Research Center (4). <a href="http://depts.washington.edu/hiprc">http://depts.washington.edu/hiprc</a></p>
<p>Older children and adults are much more likely to drown in natural bodies of water than in swimming pools. Alcohol use is involved in about 50% of drownings among teenage boys (NCIPC factsheet). In indigenous communities in Canada, alcohol is a factor in half of all drownings related to boat travel. In Canada, only about 10% of victims of boating drownings were wearing a personal flotation device (PFD) (Barss et al).</p>	<p>PFD and float coat education and distribution programs appear promising in increasing the use of these safety devices among boaters in Alaska Native villages (Ron Perkins, Alaska Injury Prevention Center). These programs have involved a public awareness campaign combined with sales of low cost float coats. Another promising program being supported by the US Coast Guard in Alaska is the Kids Don't Float Program. This is a PFD loaner program at village community beaches and boat launching areas.</p>	<p>Consumer Product Safety Commission. <a href="http://www.cpsc.gov/consumer.html">http://www.cpsc.gov/consumer.html</a></p> <p>NCIPC, CDC, Drowning Factsheet <a href="http://www.cdc.gov/ncipc/factsheets/drown.htm">http://www.cdc.gov/ncipc/factsheets/drown.htm</a></p> <p>NCIPC, WISQARS Data <a href="http://www.cdc.gov/ncipc/wisqars/default.htm">http://www.cdc.gov/ncipc/wisqars/default.htm</a></p> <p>Barss P, Smith GS, Baker SP, Mohan D. <i>Injury Prevention: An International Perspective</i>. Oxford University Press, New York; 1998.</p> <p>Alaska Injury Prevention Center, Ron Perkins, Director. <a href="http://www.alaska-ipc.org/">http://www.alaska-ipc.org/</a></p>